CLAIMS

1. A layered conductive rod comprising a central conductive rod having a base and side walls; a first insulating layer covering the side walls; and a field emitter layer covering the first insulating layer.

2. The layered conductive rod of claim 1, further comprising a second insulating layer covering the field emitter layer.

3. The layered conductive rod of claim 1, wherein the central conductive rod is selected from the group consisting of a cylindrical rod, a rectangular rod, and a triangular rod.

4. The layered conductive rod of claim 1, having a diameter of about 200μm to about 1000μm.

5. The layered conductive rod of claim 1, wherein the central conductive rod is selected from the group consisting of a copper rod and a tungsten rod.

6. The layered conductive rod of claim 1, wherein the central conductive rod comprises a rod having a conductive layer covering the rod.

7. The layered conductive rod of claim 6, wherein the rod comprises a material selected from the group consisting of an insulating material and a conductive material.

8. The layered conductive rod of claim 1, wherein the field emitter layer is a carbon-based material.

9. The layered conductive rod of claim 8, wherein the carbon-based material is selected from the group consisting of carbon nanotubes, vulcan black, and vulcan black mixed with nanoparticle size silica.

10. The layered conductive rod of claim 1, wherein the first insulating layer and the field emitter layer form concentric layers around the side walls of the central conductive rod.

11. The layered conductive rod of claim 1, wherein the base of the central conductive rod is exposed.

12. The layered conductive rod of claim 11, wherein the side walls are layered in the proximity of the base.

13. The layered conductive rod of claim 12, wherein the first insulating layer is recessed from the base.

14. The layered conductive rod of claim 1, wherein the layered conductive rod is an electron source.

15. A method of operating a vacuum tube comprising the layered conductive rod of claim 1.

16. A vacuum tube comprising:

a housing; and

a layered conductive rod positioned in the housing, the layered conductive rod including a central conductive rod having a base and side walls; a first insulating layer covering the side walls; and a field emitter layer covering the first insulating layer.

17. The vacuum tube of claim 16, wherein the field emitter layer is a carbon-based material.

18. The vacuum tube of claim 17, wherein the carbon-based material is selected from the group consisting of carbon nanotubes, vulcan black, and vulcan black mixed with nanoparticle size silica.

19. The vacuum tube of claim 16, further comprising a second insulating layer covering the field emitter layer.

20. The vacuum tube of claim 16, wherein the base of the central conductive rod is exposed and the side walls are layered in the proximity of the base.

21. The vacuum tube of claim 16, wherein the housing comprises a glass envelope.

22. The vacuum tube of claim 16, wherein the housing comprises a tube of a catheter.

23. The vacuum tube of claim 16, further comprising a second conductive rod positioned in the housing opposite the base of the central conductive rod.

24. The vacuum tube of claim 16, further comprising a getter bead inserted within the housing.

25. The vacuum tube of claim 16, further comprising a layer of conductive material covering at least a portion of the housing.

26. The vacuum tube of claim 16, wherein the layer of conductive material is polydimethylsiloxane (PDMS).

27. A process for fabricating an electron source, comprising:

(a) covering at least one end of a conductive rod with a first insulating layer, wherein at least one end of the conductive rod further comprises a base and a side wall; and

(b) covering at least a portion of the first insulating layer with a layer of a field emitter material to form a field emitter layer.

28. The process of claim 27, wherein step (a) comprises covering the base and a perimeter of a side wall adjacent the base.

29. The process of claim 27, wherein steps (a)-(b) comprise at least covering the side wall.

30. The process of claim 27, wherein the first insulating layer comprises a thickness in the range of about 0.5μm to about 10μm.

31. The process of claim 27, wherein the field emitter layer comprises a thickness in the range of about 0.1μm to about 4μm.

32. The process of claim 27, further comprising covering at least a portion of the field emitter layer with a second insulating layer.

33. The process of claim 27, wherein step (a) comprises dipping at least one end of the conductive rod into an insulating liquid and allowing the conductive rod to cure.

34. The process of claim 27, wherein step (b) comprises dipping the least one end of the conductive rod into a carbon-based solution and allowing the conductive rod to cure.

35. The process of claim 27, wherein steps (a)-(b) comprise a process selected from the group consisting of sputtering and chemical vapor deposition.

36. The process of claim 27, further comprising covering the at least one end of the conductive rod with a layer of a protective material.

37. The process of claim 36, further comprising removing the first insulating layer and the field emitter layer from the base of the conductive rod to form a conductive rod having an exposed base and a side wall that is layered in the proximity of the exposed base.

38. The process of claim 37, wherein removing is accomplished by a process selected from the group consisting of polishing and grinding.

39. The process of claim 37, further comprising removing a portion of the first insulating layer so that the first insulating layer is recessed with respect to the exposed base.

40. The process of claim 39, further comprising removing the layer of the protective material.

41. A method of operating a vacuum tube which comprises a housing having a layered conductive rod and a second conductive rod each positioned in the housing, the method comprising:

applying a first voltage bias to an inner rod of the layered conductive rod with respect to a field emitter layer of the layered conductive rod; and

applying a second voltage bias to the second conductive rod with respect to the inner rod, thereby accelerating electrons from the field emitter layer to the second conductive rod to generate x-rays.

42. The method of claim 41, wherein applying a first voltage bias to the inner rod of the layered conductive rod comprises applying a voltage in the range of about 20V to about 150V.

43. The method of claim 41, wherein applying a second voltage bias to the second conductive rod comprises applying a voltage in the range of about 15kV to about 20kV.

44. A method of removing tissue deposits in a mammal comprising operating the vacuum tube according to the method of claim 41.

45. The method of claim 41, further comprising applying a ground potential to the field emitter layer.